

FIRE PROTECTION ANALYSIS OF CAMPUS BUILDING

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1 Executive Summary

A prescriptive and performance based analysis has been conducted on a College Campus Building in Southern California. This building is still in the approvals process and has been designed to meet the design standards in the 2010 California Building Code (CBC) and relevant NFPA codes.

The building is proposed to be the center of operations as well as having administration facilities for the College. It will house an administrative office, production and support facilities. The project is three stories and includes a balcony that does not qualify as a story. The top floor is greater than 30 feet from grade and the largest floor has an area of approximately 12,500 square feet. The building is comprised of Group A and B occupancies in a separated mixed-use configuration. The building will be of Type II-B construction.

The prescriptive analysis has been evaluated based on the following systems:

- Egress Components
- Fire Rated Construction
- Fire Alarm Systems
- Fire Suppression Systems

The performance based analysis has been conducted for a number of fire scenarios using the following programs:

- Fire Dynamics Simulator (FDS)
- Simulation of Transient Evacuation and Pedestrian movementS (STEPS)

The required safe egress time (RSET) and available safe egress time (ASET) have been calculated and analyzed to determine if the fire and life safety goals have been achieved.

Analysis found that even though the building is prescriptively designed, performance based analysis results did not meet the design criteria. Based on the results recommendations have been discussed to increase the safety and performance of the building during a fire event.

There are limited alternative approaches that can be applied to assist the current fire protection systems. There is no approach that can completely eradicate the risk of life safety and other damages related to a fire event, but there are prospects to diminish the risk. There are four recommendations that will be discussed but there are other feasible options that will not be addressed.

- Phased Evacuation: Utilizing a phased evacuation strategy would allow appropriate time for occupants to safely egress the building in tenable conditions. Voice notification is to be used in the design required by the campus codes and various commands can prompt the appropriate level(s) to evacuate.

- **Additional Stair Enclosure:** By enclosing the open stair, the stair would be permitted to be used for egress. Having an additional egress stair will allow the evacuation times to be reduced. A modification may be submitted to only require fire rated doors with hold opening hardware at the top of the stairs because the adjacent walls are currently rated. The exterior wall is 1 hour rated due to separation distance from the property line and the elevator hoistway is on the opposite side. Further analysis would be required to understand if this option is viable.
- **Smoke Control System:** Through various code exceptions the building does not require a smoke control system. When analyzing the results of a fire event and the rapid loss of tenability, it is strongly recommended and encouraged that the College Campus installs a mechanical smoke control system. The benefit of incorporating a smoke control system will increase the time available for occupants to safely egress the building. This is done by extracting the smoke at high levels, removing the hazardous smoke, and reducing the rate of smoke dissension. Additional analysis will be required to determine how much exhaust would be required to maintain tenable conditions.
- **Reduce the fuel load:** The current floor plan of the building shows many workstations below the opening of the atrium. The large fuel load of this area coupled with the elevation to the ceiling causes the increased detection time and an increased notification time. It is recommended that either the fuel load of this area be reduced (less workstations spaced farther apart) or the materials of the workstation be further considered and more appropriate material property data be obtained (have a reduced soot yield and CO yield). Another viable option would be to restrict the materials based on their cumulative heat release rate.